DOCUMENT RESUME

ED 188 492 FL 011 536

AUTHOR Ulijn, Jan M.
TITLE Conceptual and Syntactic Strategies in Reading a Foreign Language.
SPONS AGENCY Netherlands Inst. for the Advancement of Pure Research, The Hague.
PUB DATE 28 Feb 80
NOTE 56p.; Paper presented at the Los Angeles Second Language Research Forum (3rd, Los Angeles, CA, February 29-March 2, 1980). Some faint type.

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS College Students; Engineering; French; Function Words; Higher Education; Language Processing; Language Research; Linguistic Theory; Psycholinguistics; *Reading Comprehension; Reading Research; *Second Language Learning; Semantics; *Sentence Structure; *Syntax; Technical Writing; Translation
IDENTIFIERS Netherlands

ABSTRACT

Conceptual and syntactic strategies in reading a foreign language are considered with attention to the functioning of the sentence parser. Topics of analysis include: the theoretical background and the educational relevance of the question of strategies; a study of the relative importance of the two parsing principles (syntactically guided analysis and conceptually guided analysis) with Dutch engineering students reading French instructions for a machine called SHADOK; a study in which second language readers were forced to make a thorough syntactic analysis by translation in their first language; a replication of one of the basic findings of the study with Dutch engineering students; conclusions drawn from the studies about the conceptual/syntactic dilemma; and implications for teaching foreign language reading. Findings indicated that readers of a foreign technical text were frequently hampered by all kinds of content words, which are necessary for their conceptual analysis, and were hampered to a much lesser degree by syntactic function words. The conceptual analysis overshadowed the role of the first language syntax. Findings indicate that the sentence parser is primarily concept-oriented. (SW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED188492

CONCEPTUAL AND SYNTACTIC STRATEGIES IN READING A FOREIGN LANGUAGE

Jan M. Ulijn

1. Theoretical background

1.1 The functioning of the sentence parser: Conceptual versus syntactic guidance in foreigh language (FL) reading

2. The relevance of the conceptual/syntactic dilemma for teaching FL reading

3. The SHADOK project

3.1 Is a thorough conceptual analysis in FL reading necessary?

3.2 Is a thorough syntactic analysis in FL reading necessary?

4. A thorough syntactic analysis in FL reading and the role of mother tongue/foreign language (L1-L2) syntactic contrasts (the translation experiment)

5. A thorough conceptual analysis in FL reading and the role of L1-L2 syntactic contrasts (the replication experiment)

6. Discussion of the experimental evidence from Parts 3, 4, and 5, and implications for conceptual or syntactic strategies in FL reading

7. Conclusion

7.1 Implications for teaching FL reading

Acknowledgements

References

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Jan M. Ulijn

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

FLQI 536

CONCEPTUAL AND SYNTACTIC STRATEGIES IN READING A FOREIGN LANGUAGE

Jan M. Ulijn

Eindhoven University of Technology

Department of Applied Linguistics

Introduction

The purpose of this article is to examine the question of to what extent people do use a syntactic strategy in reading a foreign language (FL or L2) and to what extent is a conceptual strategy used. The main point of focus is that in order to comprehend a sentence, a successful FL reader needs a thorough conceptual analysis, but can miss a thorough syntactic analysis. In Part 1, the theoretical background of the question is sketched; i.e., in which kind of model does it fit? Part 2 deals with the educational relevance of the question. In Part 3, the findings of an exploratory analysis of one specific kind of FL reading are summarized: the analysis was concerned with Dutch engineering students reading French instructions for a machine called SHADOK. In Part 4, the results of an additional experiment are presented in a more hypothesis testing approach, forcing L2 readers to make a thorough syntactic analysis by translation in their L1. In Part 5, a replication of one of the basic findings in Part 3 is reported: syntactic L1-L2 contrasts do not hamper more than syntactic L1-L2 parallels in FL reading. This finding just relates to the fact that syntactic structures remain unnoticed in a conceptual strategy which makes a thorough syntactic analysis superfluous. Finally, the results of the different experiments are compared and discussed

(Part 6) in order to draw a general conclusion about the conceptual/syntactic dilemma (Part 7), and to consider the implications that this might have for teaching FL reading.

1. Theoretical Background

For the last two decades several models[1] for reading have been proposed. Roughly, three kinds of models can be distinguished. Before 1970, reading teaching models were dominant, with some reference to linguistic factors (Robinson, 1966; Gray, 1968). Readability formulae belong to this category (Klare, 1963). After 1970, functional psychological (Mackworth, 1972; Rothkopf, 1972) and psycholinguistic models came more into discussion, with a growing interest in linguistic factors. Reading teaching and functional psychological models stress the aspects common to L1 and L2, whereas psycholinguistic models are more language specific. We are convinced that the psycholinguistic models are more pertinent to L2, since it is a commonplace observation that a FL learner normally starts FL reading after having learned to read in the mother tongue. So what remains to be acquired is the language and mastery of its specific difficulties and not so much general reading characteristics.

All psycholinguistic models share a clear distinction of several linguistic levels operating in reading. They correspond roughly to levels in the linguistic description of the input to be read: graphemic or graphonic, morphological, lexical, syntactic, textual, and semantic. In a text,, letters, words, sentences, and textual units as paragraphs have to be processed, and meaning has to be attributed to all these elements. As Winograd (in press) points out, all these levels are part of structures in the

input (he distinguishes seven), but it is not sure whether all these elements have to be processed by the reader to determine the meaning of a text. This, of course, depends on many other factors, such as objective of reading, knowledge of the language to be read, background knowledge of the topic, etc. That is why a model where some levels as syntax and morphology are more a part of the operation of the different elements involved in reading was preferred in constructing this study.

Another problem in taking a straightforward linguistic model in reading has been the order in which the different levels would be processed or the kind of integration that would be involved, if we consider reading as a skill built up in subskills, of which hierarchy, automation, anticipation, and feedback are important characteristics (Herriot, 1971; Ulijn, 1977). Elsewhere different proposals for this integration--bottom-up, top-down, and interactive--have been discussed (Ulijn, 1980). The interactive proposal seems to account best for all experimental evidence available on the integration of the different levels. In this proposal there would be an interaction between all linguistic levels. These interactions operate simultaneously and interdependently (Rumelhart, 1977). This corresponds to the flexible stratified processor proposed by Winograd (in press) for processing of texts by computer. For this purpose a computer system organized in sequential stages (bottom-up or top-down) would be extremely brittle. If there is a problem at the beginning stage the whole system would break down. Bottom-up, top-down, and interactive models all leave one question unanswered: Which place should have the semantic level? Since practically all reading is oriented to comprehension which requires semantic processing, this level should have a special status in a reading model.

The most powerful interactive reading model can be derived from the psycholinguistic literature concerning the language user is man, since this permits an integrative view of comprehension, semantic and syntactic aspects (see Kempen, 1976; Ulijn, 1978; and the literature they refer to). The psycholinguistic model contains six main systems: (a) the speech or script recognizer, (b) the sentence parser, (c) the conceptual system, (d) the lexicon, (e) the sentence generator, and (f) the articulator or handwriter. Only the first three are at work in reading (Figure 1; see also Winograd, in press). Here elements such as the phonological level in reading are part of the operations and knowledge of the FL reader just as to how a text in that specific language or in general is organized, syntactically, morphologically, and textually, is part of the conceptual system.

- - - - - - - - - - -

Figure 1 about here

- - - - - - - - - - - -

It seems to be difficult to exclude a phonological decoding in reading. As Underwood and Holt (1979) pointed out after reviewing some experimental evidence: it is clearly used, but is still unclear why it is useful. Phonological reading is not necessary for word recognition and reading. For L2 it could even be excluded--it should be possible to learn to read Latin, Greek, Russian, Japanese, or Chinese, or any other FL without decoding, but since that skill always precedes in L1 and almost always in L2 reading (because of oral needs), it does not seem reasonable to avoid such a helpful cue.

The sentencer parser in this model could extend its operation also to complete text. This expansion has been deliberately left out, although it is often difficult to distinguish between two single sentences and one coordinated sentence which can convey exactly the same conceptual load. The current attention paid to textual analysis coincides with a growing interest shift in linguistics and psycholinguistics from sentence to text (for a good review see Pugh & Lunzer, 1979). Syntax, however, concerns the sentence level and the present study is limited to that.

There is a strong interaction between the different systems visualized in Figure 1. There are feedback circuits; for instance, when the script recognizer, lacking sufficient information, sees that it cannot do its work, it can ask the eye(s) to look more closely. It can also appeal to the lexicon or the conceptual system to make sure that the script belongs to any specific language. This specific language is one in which the lexicon contains the word labels and the conceptual system contains the corresponding meanings. All systems are accessible at the same time and can be switched on when necessary in order to determine the meaning of a sentence. This does not mean that there would be no specific order of operation of the different systems which is more efficient than another. A temporal staging from eye(s) to conceptual system seems to be likely.

1.1 The functioning of the sentence parser:

Conceptual versus syntactic guidance in FL reading.

Winograd (in press) distinguishes five different processors and six sets of rules to be used in processing the input with seven levels. We think of two processors--the script recognizer and the sentence parser--

and two knowledge bases--lexicon and conceptual system. Here we are chiefly concerned with the functioning of the sentence parser in the context of reading texts in a foreign language. The parser's task is to detect the "conceptualization" underlying each sentence of an input text. The parser starts out from the results obtained by the script recognizer, uses its own syntactic knowledge and has access to conceptual system and lexicon for conceptual and lexical information. Two ways are open for the parser's operation: syntactically guided analysis and conceptually guided analysis, as proposed by Clark and Clark (1977) and Kempen (1976). These authors reach their conclusions on the basis of the experimental literature they cite, and refer mainly to listening, but it is assumed that the reading process is quite similar.

Clark and Clark describe the syntactic approach as follows:

> These strategies use function words, suffixes, prefixes and grammatical categories of content words as clues to the identity of constituents and build propositions from these constituents. In the semantic approach the strategies take advantage of the fact that sentences refer to real objects, states, and events, and fit the ongoing discourse. Generally, these strategies begin with propositions that make sense in context and then check for surface constituents that express these propositions. Listeners probably rely on some flexible combinations of these strategies. (p. 85)

Kempen (1976) argues on the basis of Schank's (1975) interpretation system (see also Ulijn & Kempen, 1976) that conceptually guided reading is much more efficient. Here the parser applies a superficial and incomplete

syntactic analysis to the input in that only the surface subject noun and the main verb of the sentence are located. Then the lexicon is consulted in order to make available the conceptual information listed in the entries for main verb and subject noun.

On the basis of this conceptual information, the parser generates expectations about the identity of further possible constituents of the input sentence. It might even be possible to locate content words in the text to link them to concepts by means of the lexicon and conceptual system and to guess a posteriori the syntactic structure of the sentence, if this is still necessary for efficient comprehension. In the case of syntactic guidance a preliminary thorough syntactic analysis would be performed anyway, but this would still have to be complemented by a conceptual analysis. Thus, the parsing process is controlled by conceptual knowledge rather than by the application of syntactic rules. Experimental evidence presented by Pynte (1978) shows that in any case some specific lexical knowledge has to be applied at various points in the sentence in order to make perceptual decisions about syntactic organization. Pynte discovered that in reading French as L1 more processing time was spent on words which remove the ambiguity of the sentence, and this can take place at any constituent in the sentence.

In either case of analysis--syntactically or conceptually guided--a thorough conceptual analysis would be needed anyway. The main point of the present study would be: Is a thorough syntactic analysis of a sentence necessary to comprehend that sentence or not? In the case of a syntactic

guidance or strategy of reading it would be necessary; in the case of a conceptual guidance or strategy it would not be necessary.

It seems appropriate here to comment on the use of the term conceptual instead of semantic in this study. The term conceptual basically originated from the semantic networks (Schank, 1975). Concepts here are seen as pieces of knowledge (in a cognitive sense of the word). The conceptual level is the representation of the meaning in the underlying representational formalism. Conceptualizations are relationships between concepts or conceptual structures applicable even when those concepts do not correspond to single words or simple sentences. We avoid the term semantic because it is used in so many different meanings, as Winograd (in press) points out in his chapters on structural, procedural semantics, and semantic networks. All these approaches give different kinds of meanings to words, sentences and texts. One could speak about conceptual and syntactic strategies as part of explicit strategies on behalf of the reader in tackling the meaning of a text.

2. The Relevance of the Conceptual/Syntactic Dilemma for Teaching FL Reading

For several decades, much attention has been paid to syntactic analysis in FL teaching. Especially in grammar-translation-methods, explicit syntactic knowledge was taught in order to translate from L2 to L1. Translation was often used as a test of syntactic knowledge of FL, and as a check on the reading comprehension of a text. This last point was a delicate one. It has been a common experience of generations of teachers of classical languages and their pupils in the secondary school that good

grammatical translation is quite possible without understanding the text. How many pupils were able to translate correctly Plato's texts from Greek in their L1 without comprehending his philosophy? Also the audiolingual approach, when applied to reading, stressed the role of syntax in reading and even gave rise to less comprehension of a text. Since comprehension is the main purpose of reading and semantics is a main concern of current linguistic and psycholinguistic approaches, right now it seems worthwhile to ask the question: How much syntax is still needed in successful reading comprehension? The answer to this question has important bearing on the work of curriculum developers in charge of designing FL reading programs, and on the work of FL teachers performing them.

Researchers in FL reading do not agree on the question raised. Aronson-Berman (1978) proposes the thesis that a major component of difficulty encountered by advanced level students in reading FL texts is the nature and degree of syntactic complexity. A pilot study conducted by Aronson-Berman with Hebrew-speaking college students showed a significant difference in success in comprehending two versions of an English text, one syntactically simplified, the other not, but with a similar content and vocabulary. Cowan (1976) connected syntactic L1-L2 contrasts with reading and concluded that on the basis of English read by Japanese and Persians, and Hindi read by English-speaking subjects, comprehension errors result from syntactic misinterpretation because of L1-L2 contrasts. Unfortunately, his description of the reading process is very superficial and his error analysis rather unsystematic, hence one cannot conclude that these data support the syntactic guidance in FL reading, further research

is required. If reading is mainly conceptually guided, all kinds of syntactic variants would play only a minor role.

Vocabulary usually appears to be a more serious obstacle in FL reading, however. Results of questionnaires on ESL reading difficulties handed out to students with varying linguistic backgrounds ranged for vocabulary from 3.23 to 3.36, and for grammar from 2.19 to 1.29 (5 = very difficult, 1 = no difficulty; Yorio, 1971). High correlations are found between reading comprehension and vocabulary (Konttinen, 1978). A recent pilot experiment has suggested that Dutch secondary school pupils use verb endings rather than time expressions in order to detect the tense of French sentences. The position of a time expression in the sentence had a minor significant effect (van Wesemael, 1979). Morphology such as verb endings and lexicon such as time expressions seem to play a more important role than such syntactic elements as word order. These data question syntactic guidance in FL reading.

Cziko (1978) is one of the rare researchers who takes both conceptual and syntactic strategies into account. He uses the terms semantic and syntactic constraints. In this study a beginning, an intermediate, and an advanced group of English-speaking seventh-grade students and a native French group were asked to read two semantic normal, two semantically violated, and two semantically and syntactically violated French texts. All groups read the semantically violated texts significantly faster than the semantically and syntactically violated texts ($p < .05$), but only the native and advanced group read the semantically normal texts significantly

faster than the semantically violated texts ($p < .05$). On the basis of these results Cziko concludes:

> These findings suggest that while even readers with only beginning knowledge of a second language are able to use the syntactic constraints of a passage as a useful source of information in reading, only readers with a relatively high level of competence in a second language are similarly able to use the semantic constraints. It appears, then, that for adolescent readers of a second language, sensitivity to the syntactic system of a second language develops prior to sensitivity to the semantic system. (pp. 478, 479)

The last point may be true, although the used experimental technique does not seem to be suitable to drawing conclusions about a priority or a temporal order in development. An alternative explanation of these results seems more plausible: when the texts are semantically violated, then the readers are forced to make a thorough syntactic analysis of the sentences to make any sense of it. In this case, syntactic violation means an additional handicap and gives rise to a lower reading time in all the stages (beginning, intermediate, advanced, and native). When the text is semantically violated, a perfect syntactic order may not be needed by advanced and natives, because they have sufficient word knowledge to figure out the meaning without syntax (semantic violation means that the right words are there in a good syntactic structure, but in the wrong place). Beginners and intermediates lack the syntactic knowledge to allow the sentence parser to make the necessary superficial initial syntactic analysis, so their reading

time will be higher when the text is semantically and syntactically correct, so that they do not have to cope with any syntactic order which hampers a good syntactic analysis.

These results are consistent with the previously stated view of the functioning of the sentence parser in FL reading. The type of reading researched by Cziko was not normal. The fact that each student was instructed to read the texts as quickly as possible without paying attention to the meaning of the text (!) and the fact that some texts were semantically violated, forced readers to make a thorough syntactic analysis which probably does not take place when FL reading is normally comprehension-oriented.

In Parts 3, 4, and 5, data on the main question are presented. These data support the hypothesis that a thorough conceptual analysis is necessary, a thorough syntactic analysis is not. Because the experiments in Parts 3 and 4 are reported in detail elsewhere (Ulijn, 1978; Ulijn & Kempen, 1976; Ulijn, 1979) they will be only briefly described. The last replication experiment is only briefly described elsewhere (Ulijn, in press), and will be reported in more detail.

3. The SHADOK-Project

Future and acting engineers in Holland have to cope sometimes with French related to their vocational field. This is not an easy task in light of their educational background, i.e., most have studied French only on the intermediate level. In 1971, an experimental setting was created at Eindhoven University of Technology to explore engineering students' difficulties in reading French. Subjects were 43 Dutch electrical engineering

students who were asked to read French instructions for using a display unit of an apparatus named SHADOK (the name of a popular French TV cartoon character). The answer panel was connected to a computer, thereby allowing the researchers to record reading times and erroneous technical manipulations. The text was comprised of 53 sentences distributed over 14 simple technical problems in logic, coding, binary calculations, and so on. After reading and trying to solve the technical problems, the text was submitted to students and they were asked to underline the difficulties they experienced and to classify them in terms of technical, linguistic, and other categories.

The students were grouped in three conditions of increasing technical and three conditions of increasing French knowledge (sophomore, intermediate, near-advanced). A preliminary variance analysis on their scores (number of correct technical manipulations) demonstrated both French and technical knowledge to be significant factors (Ulijn, 1975). The reliability and the validity of this SHADOK test as a test of reading comprehension of technical French appeared to be very high. Thus, it seemed useful to explore in more detail the cause of the lack of comprehension by the subjects. Starting with the computer configurations of erroneous manipulations, the experimenter-engineer could determine key words of difficulties in the text which could have led to the wrong answer. The experimenter-linguist could make a list of difficult words underlined as such by the subjects, classified in technical, linguistic, and other categories. A flow chart was made to retrace the difficulties to their specific causes, and difficulties were processed using the sources of

information derived from the experiment. The difficulties which appeared to be due to a lack of French knowledge were split into lexical and syntactic problems. The lexical problems comprised 166 types (different words) out of 257 types in the total SHADOK test. The load difficult or not of the lexical items made it possible to do some analyses with respect to the main question: Is a thorough conceptual and syntactic analysis necessary in FL reading? A hierarchy of lexical difficulty within subjects was not included. Such a hierarchy reflected more a function of word knowledge of the individual subjects than a general strategy of FL reading. The result of the deduction system from word to lexical difficulty (arguing from the standpoint of available objective and subjective data) was considered to be more suitable for our purpose.

3.1 Is a thorough conceptual analysis in FL reading necessary?

Two predictions can be made based on the assumption that a thorough conceptual analysis in comprehension-oriented FL reading is necessary: One within the target language French; one with respect to the first language, Dutch, and/or a better known FL such as English.

1. Within French: Polysemous concept words will cause more reading difficulty than one-concept words. Even if the different meanings of a polysemous word are known to a FL reader, he has to make a thorough conceptual analysis. He will have more trouble to select the right one, than if the word has just one meaning and the reader knows it. When the reader knows only the meanings which are not intended, then he will also have more trouble with polysemous words. Only when ignoring completely

the one-concept words and knowing only the intended meaning of the polysemous words could a reverse effect occur, but this is very unlikely to be the case. There is some experimental evidence of the difficulty of lexical polysemy in L1 reading. Mason et al. (1979) found that third- through sixth-graders of a primary school were more accurate in selecting the meanings in contexts which support their most common meanings than when the contexts support the less common meanings. After having reviewed several experiments in language processing (mainly oral, but also relevant for reading), Levelt (1978) concludes that lexical ambiguity[2] almost always increases the processing load of a sentence.

Within the 257 types of the SHADOK text, 166 concept words could be located. They comprised 90 polysemous words and 76 one-concept words. The distinction was made through the use of LEXIS, a French monolingual dictionary by Dubois (1975) which gives different entries for each meaning of a polysemous word that is a homographic homophone (same spelling, same pronunciation). Just one entry is given in LEXIS for different usages or contexts of one meaning or concept (with different subentries). Examples of polysemous words are: bouton, exercice, mesure, pont, résistance, sens, tension, unité, devoir, passer. Examples of one-concept words are: codage, digit, écran, fois, fonctionnement, lampe, manipulation, minimiser, ohm, position. The 166 concept words could also be divided into 67 difficult and 99 not difficult categories according to the method described in Part 3.

- - - - - - - - - - -

Table 1 about here

- - - - - - - - - - -

2. With respect to the mother tongue Dutch and/or a better known FL, English: Misleading cognates will cause more reading difficulty than cognates. If a Dutch reader has to make a thorough conceptual analysis of a French sentence and he does not know a French word, he will try to guess the meaning when this word has a similar form to Dutch or to a language which he knows better than French, such as English. This operation will be successful when it leads to the same meaning (cognates), but the reader will be put on the wrong track when the meaning differs (misleading cognates). Therefore, misleading cognates will be more difficult than cognates. In the SHADOK text there were 20 technical terms. They could be divided into five terms which have a specific form related to Dutch and/or English, but with a different meaning. Examples of cognates: binaire, câbler, codage, code, coder, conversion analogique digitale, potentiomètre, transformée, voltmètre. Examples of misleading cognates: borne resembles English borne or born, but is Dutch/English plug; interrupteur resembles Dutch/English interruptor, but is Dutch knop(je)/English switch; voyant resembles Dutch voyeur, but is Dutch lichtje/English light (for a complete list of examples see Ulijn, 1978).

The 20 terms could be divided into 11 difficult and 9 not difficult categories according to the method described in Part 3.

- - - - - - - - - -

Table 2 about here

- - - - - - - - - -

A chi-square analysis of a 2-by-2 design was not possible because there were cells with less than five observations. Inspection of the data

shows that French cognates caused less reading difficulty than French misleading cognates. The direct one-tailed chance was measured, with only one alternative that this observation was not true: $p = .03$, that is, if it is true that there is no correlation, then there is a chance of 3 in 100 within the given marginal distributions that a similar or more extreme distribution emerges (exact probability-test of Fisher). The correlation is thus significant in the indicated way. If a thorough conceptual analysis were not necessary, a reader would not revert to using the mother tongue to guess unknown words.

Both results support the view of a thorough conceptual analysis in FL reading (see Part 6 for the discussion of these results, however).

3.2 Is a thorough syntactic analysis in FL reading necessary?

Two predictions can also be made based on the assumption that a thorough syntactic analysis in comprehension-oriented FL reading is unnecessary: One within the target language, French; one with respect to the first language, Dutch and/or a better known FL such as English.

1. Within French: Content words will cause more reading difficulty than syntactic function words. If a reader does not really need a thorough syntactic analysis, syntactic function words which are difficult or unknown and essential only for such an analysis can be avoided. Since a reader will need a complete conceptual analysis, the difficult or unknown content words cannot be avoided, so content words will hamper comprehension more than syntactic function words. The 257 types of the SHADOK text could be divided into 166 content and function words according to the distinction

made in le Français Fondamental (in a later version of Gougenheim, 1964, by the French Ministère de l'Education Nationale). The main task of function words (i.e., conjunctions, auxiliaries, prepositions, and articles) is to sustain the syntactic structure of a sentence. Their set in a language is small and difficult to expand. Content words (i.e., nouns, adjectives, verbs, adverbs) have as a main task to specify the meaning of the sentence. Their number is massive and it grows daily.

The 257 types of words used in the study could also be divided into 131 difficult and 126 not difficult categories (for complete lists see Ulijn, 1978, Appendix 2, pp. 174-177, or Ulijn, 1979a; Ulijn, 1978, Appendix 5, pp. 182, 183).

- - - - - - - - - - -

Table 3 about here

- - - - - - - - - - -

2. With respect to the mother tongue, Dutch: Contrastive syntactic structures will not necessarily cause more reading difficulty than parallel syntactic structures. If a Dutch reader of a French text does not need a thorough syntactic analysis, the fact that syntactic structures differ from the mother tongue will remain unnoticed. Contrastive structures will be rather an intrinsic difficulty of French so that French readers of the same French text will show a similar pattern. Contrastive French/Dutch syntactic structures will not cause more reading difficulty than French/Dutch parallel structures because they are contrastive.

The SHADOK text was comprised of 53 sentences of which 13 were distributed over three syntactic structures: relative, temporelle, and consécutive.

These sentences were written either to parallel or to contrast the syntactic structure of the Dutch language--subordinate clauses, as opposed to infinitive and participle constructions which hardly occur in Dutch (see Appendix 1). On the basis of the flow chart developed in the SHADOK project it was not easy to decide on the difficulty of a syntactic structure. Readers do not have a clear idea of what a syntactic structure is and are mainly dealing with words. Since a syntactic structure often concerns a complete sentence, an assumption was made that reading time would be a more valid and reliable measure for reading difficulty. Unfortunately, we could not control for different content between the sentences and thus for different lexical difficulties. Since all 13 sentences under investigation differed in length, indexing was necessary. Reading times were corrected for sentence length by dividing by the number of words per sentence.

Since a description of this analysis is reported elsewhere in great detail (Ulijn, 1977; 1978), and because in Part 5 a replication experiment is described which copes with the shortcomings of this first exploratory study, only the main results seem appropriate to present here. The mean reading time indexes of the 13 sentences by the Dutch students showed that contrasts with the first language took more reading time than parallels when a relative was expressed. For the temporelle and consécutive, the parallel structure took longer. The same pattern of difficulties, however, was found for the French readers, even though they processed the sentences containing the above mentioned syntactic variant three times more quickly than the Dutch students.

On the basis of these results, it is difficult to speak about an L1-L2 interlingual effect, when the same interlingual effect is observed within L1 with an identical pattern. There is an indication here that L2 readers do not need a thorough syntactic analysis which would produce more specific and over all trouble with syntactic structures contrasting their L1, but careful replication experiments are needed. The main reason is that the compared sentences differed in content and contained different lexical difficulties.

4. A Thorough Syntactic Analysis in FL Reading and the Role of Mother Tongue/Foreign Language (L1-L2) Syntactic Contrasts

In Part 3.2, information was presented that indicated that in conceptually guided L2 reading, a thorough syntactic analysis is not necessary, so L1-L2 syntactic contrasts do not seem to hamper more than L1-L2 syntactic parallels. In light of that information, the assumption was made that when L2 readers are forced to make a thorough syntactic analysis, L1-L2 syntactic contrasts should hamper. An L2 reader who lacks essential conceptual information will be forced to read word by word and to capitalize on syntactic knowledge in order to detect the hidden conceptualizations. In a situation such as that, it can be predicted that syntactic contrasts also will hamper comprehension of the text. Another experiment (Ulijn & Kempen, 1976; Ulijn 1979a) gave evidence of this point. The same type of French text was used with regard to semantic structure as the SHADOK text (i.e., instructions for use). Fifteen parallel/contrastive sentences were included, but now controlled for conceptual content (the linguistic form of the text was similar to Appendix 1).

Two texts were prepared, one containing seven parallel and eight contrastive sentences, and the other eight parallel and seven contrastive sentences, so that every sentence had two versions. The sentences were distributed over seven different syntactic structures: temporelle, relative, consécutive (as in Part 3.2), and opposition, impératif, voix passive/moyenne, and nécessité.

Forty-three Dutch psychology students without any technical knowledge and without access to the SHADOK apparatus itself, were randomly assigned to one of the two texts and asked to translate the corresponding French sentences into Dutch. The subjects were forced to use a syntactic strategy in order to comprehend the text as far as possible. The comprehension index here was the number of correct interpretations of the French text.

The translations of the text showed more interpretation difficulty for contrastive than for parallel versions (sign test, highly significant at $p < .001$).

Another subsidiary result is worth noting. For most of the sentence pairs a majority of the subjects managed to produce correct translations. There is one striking exception: à moins que (parallel) and à moins de (contrastive) received few correct interpretations (15 and 0 percent, respectively). In this instance, the reader had to overcome confusions between conceptual patterns. À moins que and à moins de mislead, because moins (less) is associated with the concept of quantity instead of condition. Also, the Dutch equivalent of à moins que (tenzij) has no connection with the Dutch equivalent of moins (minder), unlike the English unless. In addition, it seems that unless has intrinsic difficulty of L1.

(Noordman, 1979, found in an L1 comprehension experiment that unless is more difficult to handle than if . . . then.)

5. A Thorough Conceptual Analysis in FL Reading and the Role of L1-L2 Contrasts

In Part 3.2, an indication that a conceptual strategy would override syntactic interference in reading a foreign language was explored. Dutch and French readers of a French technical text showed the same pattern of syntactic difficulty, so that there was no specific L1 effect on L2 reading. Dutch-French syntactic contrasts were not generally more difficult than Dutch-French syntactic parallels. When Dutch readers were forced to translate a text which they could not fully comprehend even with perfect French knowledge, L1-L2 contrasts did hamper (Part 4). The first result was attributed to a thorough conceptual analysis in FL reading without a complete syntactic analysis and the second was attributed to a thorough syntactic analysis, since a thorough conceptual analysis was impossible. Because of its exploratory character, the first results needed to be replicated in a more hypothesis-testing experiment. The replication assumed that a conceptual strategy made a thorough syntactic analysis superfluous in FL reading--Dutch-French syntactic contrasts were assumed not to hamper more than Dutch-French parallels and it was predicted that French readers would show the same pattern of difficulty than Dutch readers experienced in facing a French text.

5.1 Methods

5.1.1 Subjects. Twenty-four Dutch and twenty-four French speaking adults were selected as subjects for this experiment. The Dutch subjects

were all university students mainly in their third year of study. They were distributed over a broad range of disciplines: psychology, linguistics (Dutch), chemistry, biology, and physics. Their French knowledge was on the intermediate level, based on four to six years of French in the secondary school (FL teaching in The Netherlands is still rather uniform over the country; pedagogy is mainly based on a combination of grammar translation and an audiolingual approach). University students of French and other foreigh languages were excluded. The French subjects had all been residents of The Netherlands for more than half a year, and most had a fair knowledge of Dutch. They were mainly university students or university-educated, with the same broad range of disciplines as above. The French university students of French were included since this would probably not affect their reading time in French.

5.1.2 Tasks and materials. The subjects had to read a French instruction for finding their way in an imaginary French town--a kind of responsive reading. That means that the reading objective lay beyond the thorough comprehension students needed to interpret and to react to the message. The instruction (Trouver le bon chemin) comprised eight subtasks: (1) Pour le centre de la ville de Beausite, (2) pour le parking souterrain, (3) pour la cathédrale, etc. In order to encourage reading for meaning as a problem-solving process, the subjects were asked to answer a simple question after each subtask in order to test their comprehension of that item. The first subtask was to acquire experience in performing such tasks and was not included in the final results.

The complete text consisted of 34 steps, each step was expressed in one sentence (Appendix 1). For 18 of the steps we formulated two sentence versions. One version contained a parallel structure, the other a a contrastive structure. In total there were structures for 12 notions: nécessité (vous devez/il vous faut) (2 pairs), voix passive/moyenne (être-construction/se-construction), word order (2 pairs), mise en relief (c'est . . . que), subjonctif, ne-explétif, relative, temporelle (3 pairs) causale (2 pairs), condition (2 pairs), opposition, and consécutive. The last six notions contained a subordinate clause as a syntactic parallel between French and Dutch, and a participle or infinitive construction as a syntactic contrast. From the 18 pairs and the remaining 16 sentences two texts were prepared. Each text contained 16 sentences and one member of every pair of semantically similar sentences. Thus one text contained nine parallel and nine contrastive sentences. The remaining sentences in the pairs went into the other text. Both the Dutch and the French subjects were randomly divided into two groups, one group for each text. It was suspected that the text with less conceptual information would force the reader to use more syntactic analysis and that in this case syntactic contrasts would cause more difficulties than syntactic parallels. Thus each group was randomly divided into two conditions: one with and one without preliminary training in memorizing the map of the above mentioned town (Ulijn, in press, Appendix 1). It was assumed that in the first highly contextualized condition it should not make any difference whether or not the reader met a contrastive or a parallel construction; in the second, less contextualized version, it could.

5.1.3 Techniques of measurement. A device was used to record the reading times for each sentence in miliseconds. This device was connected to two remote controlled projectors in alternating operation containing slides for each sentence of the instruction. The subject was asked to push a button allowing him to see the next slide with the next sentence and recording the reading time of the preceding sentence. Each sentence was visualized in light letters on a dark background for better readability.

5.1.4 Experimental design and statistical analysis. All 18 contrastive/parallel pairs were read in conditions with the city map and without the city map (context) by both French and Dutch groups (nationality). Independent variables were contrastive/parallel, with/without the city map, and French/Dutch. The dependent variable was reading time in seconds. In order to avoid a learning effect, no subject read the same sentence in both contrastive and parallel versions. T-tests were performed to determine the effects of main importance. Because of the high correlation (r_{xy}) between the X and the Y samples in the tests (X and Y being mean reading time for the same sentences under different conditions, and compounded with that, by different subjects), t_d for dependent samples was applied rather than t_i for independent samples.

For the preliminary check on comprehension, independent variables were context and nationality; the dependent variable was the number of correct answers, maximum score seven per person, one for each subtask included in the results.[3] The variables context and nationality under two conditions each allowed a 2 x 2 design for a chi-square analysis over the total number of errors. Inclusion of the syntactic variable (contrastive/

parallel) was not possible, because of its randomized distribution over the subtasks and its irrelevance to a general check on comprehension.

Finally an exploratory comparison was made for each of the 18 sentences in their contrastive (C) and parallel (P) version in the French (F1) and Dutch (F2) conditions after a general check on the correlation between C and P within each language condition. These results are compared with those of the translation experiment in Part 4.

5.2 Results

5.2.1 General check on comprehension. Six chi-square analyses were computed and included over the absolute (not percentages) number of incorrect answers to the comprehension questions as shown in Table 4, against a thematic probability α of 50/50.

- - - - - - - - - - -

Table 4 about here

- - - - - - - - - - -

Maximally, 48 x 7 = 336 (100%) errors were possible. Looking at the percentages of incorrect answers, it was concluded that the sentences were, in general, well understood by both Dutch and French groups.

There was a weak significant general effect of nationality ($X^2 = 3.76$, $p = .0525$). This was mainly due to the condition with city map ($X^2 = 7.00$, $p = .008$). In the condition without city map, the difference between French and Dutch was not significant.

There was a significant general effect of context on error producing ($X^2 = 5.60$, $p = .018$). This derives mainly from the French who made significantly less errors in the condition with city map than in the condition

without (X^2 = 8.54, p = .003). Within the Dutch subjects the difference was not significant.

Thus, the additional contextual cue of the city map supported only the L1 reading comprehension process and not the L2 reading comprehension process.

5.2.2 Distribution of the reading times. Table 5 shows the distribution of the reading times averaged over all 18 sentences and over 24 subjects per condition.

- - - - - - - - - - -

Table 5 about here

- - - - - - - - - - -

In the city map condition, it took the Dutch subjects highly significantly longer to read the text than it did the French subjects (t_d = -8.525, $p < .001$). There were similar results for the Dutch subjects without the city map (t_d = -8.800, $p < .001$).

The Dutch subjects took significantly longer to read with city map than with the city map (t_d = -3.238, $p < .003$). The French had similar results (t_d = -5.566, $p < .001$).

Because both partial tests were significant in the expected direction, a general effect of context and nationality on reading time can be concluded. The city map increased both L1 and L2 reading time, but L1 somewhat more. This corresponds to the findings of the comprehension errors in Part 5.2.1. With the city map, the French subjects read nearly three times faster than the Dutch. Without the city map, the French subjects read twice as fast as the Dutch.

The main purpose of this study should now be considered: Is there a significant effect of the parallel/contrastive version of the sentences for L1 and L2 reading. As shown in Table 6, there was no significant difference between P and C versions of the sentences read by the French (t_d = .617), nor by the Dutch (t_d = .774).

- - - - - - - - -

Table 6 about here

- - - - - - - - -

A difference in syntactic structure (parallel or constrastive with respect to another L1-Dutch) does not affect either French read as an L1 or French read as an L2. Both French and Dutch readers showed the same pattern of difficulty. Thus, results of the exploratory experiment of the SHADOK project were largely confirmed.

5.3 Distribution of the reading times over the 12 syntactic structures covering the 18 sentences and comparison with the results of the translation experiment (Part 4)

Finally, there was interest in considering whether the P and C distinction was unimportant for every syntactic structure. In order to test this, sentence length needed to be ruled out as a factor causing differences in reading time between sentences. In order to accomplish this, reading time of a sentence was divided by the number of words of that sentence. In Table 7 reading time in seconds is presented. Figure 2 shows the same information for all sentences distributed over F1 (French subjects reading French) and F2 (Dutch subjects reading French) and over P (Parallel structure with Dutch) and C (Contrastive structure with Dutch).

- - - - - - - - -

Table 7 about here

- - - - - - - - - -

Figure 2 about here

- - - - - - - - - -

The French (F1) not only read much faster, but they demonstrated a sort of ceiling effect--reading the sentences in less time than is hardly possible. They read with the highest speed, still allowing thorough comprehension. For the Dutch (F2), however, a very important fluctuation in their reading time was observed. The apparent difference in standard deviation makes a correlation coefficient between P versions in F1 and F2 and between C versions in F1 and F2 rather unreliable.

Results of the t-tests for dependent samples calculated within F2 yielded a high correlation ($r = .88$), and no significant difference between F2P and F2C ($t_d = .774$, p .45). Within F1 comparisons again yielded a high correlation ($r = .75$) and no significant difference ($t_d = .617$, p .25) between F1P and F1C. If the P/C distinction was important for some syntactic structures read by the Dutch subjects, the first correlation would not have been so high.

The design applied does not permit statistical analysis of the contributions of specific fluctuation in reading time to the difficulty of specific French syntactic structures for Dutch readers. There do remain, however, some peaks worth considering ($\geq$ 14.0 sec. per word): <u>temporelle</u>: <u>gérondif</u> (14.1) and <u>construction absolue</u> (15.5) (both contrastive structures with Dutch); <u>consécutive</u>: <u>de façon que</u> (14.0, parallel) and <u>de façon à</u>

(16.0, contrastive); opposition: à moins de (14.7, contrastive); succesion d'ordre in: (. . .) où beaucoup de poids lourds circulent (S + V in relative clause, parallel structure with Dutch, see sentence 6.2, Appendix 1, reading time 17.3 sec. per word). The V + S construction contrastive with Dutch is just easier here.

Comparison with the results from the translation experiment (Ulijn & Kempen 1976; Part 4), was difficult to achieve, where temporelle, consécutive, opposition, voix passive/moyenne, nécessité were also assessed, since the dependent variables (reading times and numbers of correct interpretations) in both the experiments were different. Again some tentative conclusions can be made. In general, the syntactic structures were correctly interpreted, as they appeared from translations. There were some exceptions (< 50% correct); temporelle: construction absolue (43%, contrastive); consécutive: de façon à (20%, contrastive), de manière à (40%, contrastive); opposition: à moins que (15%, parallel), à moins de (0%, contrastive); voix moyenne: s'affiche (39%, contrastive). Common peaks in difficulty were: construction absolue, de facon à, à moins de, all contrastive constructions. Since the compared lists comprised only partially the same syntactic structures, this does not mean that no other common peaks between reading time and translation difficulty could emerge. A more specific experiment with an adapted design would be needed to establish those commonalities.

6. Discussion of the Experimental Evidence from Parts 3, 4, and 5, and Implications for Conceptual and Syntactic Strategies in FL Reading

The six major findings presented in the preceding paragraphs need to be listed and interpreted in terms of the original question: Is a thorough syntactic analysis necessary to comprehend FL sentences?

1. Polysemous-concept words cause more reading difficulty than one-concept words. (L1-L2 homonyms)
2. Misleading cognates cause more reading difficulty than cognates.
3. Content words cause more reading difficulty than syntactic function words.
4. Syntactic contrasts do not result in a longer reading time than syntactic parallels.
5. When FL readers are forced to make a thorough syntactic analysis of a sentence, syntactic contrasts give more problems than syntactic parallels.
6. In the last experiment, the factor nationality was significant: L1 reading was two to three times faster than L2 reading. The factor context was also significant: the access to a city map increased the rate in reading route instructions in both L1 and L2, but the contextual condition without city map was not sensitive enough to detect additional problems of syntactic contrasts. The city map did not affect the level of comprehension in L2 (by the Dutch) as opposed to L1 where the French had a great

advantage in comprehension with the city map, as measured by by the answers to questions. The factor syntactic structure (contrastive or parallel) did not have a significant effect on reading time, neither in L1 nor in L2 reading.

For several reasons one should caution against overgeneralization of these results:

1. In cases 1 through 4, the objective might best be referred to a responsive reading: a stage beyond thorough comprehension--manipulation in reaction to a message. In case 6, the objective was reading for thorough comprehension. Reading for syntactic analysis by translation was the objective in case 5.
2. The language researched was only French read by French and Dutch subjects.
3. The register in cases 1 through 5 was technical, in the last case it was rather common language. (Elsewhere a multilingual study on linguistic differences between the technical and scientific register and the common language register is reported (Ulijn, 1979b).
4. In cases 1 through 4, the level of French knowledge varied more around the intermediate level, than in cases 5 and 6.
5. Fewer problems with syntactic function words and syntactic structure in general than with content words and vocabulary in general could also be predicted by a lower frequency of the first range. The set of syntactic function words and syntactic structures in

a language is restrictive and difficult to expand, whereas a language's vocabulary grows daily.

6. The experimental variable is not the same in all the cases. In cases 1 through 3 it is successive (measurement of reading difficulty after the experiment). In case 4 it is simultaneous (reading time). In case 5 it is successive (translation). In case 6 it is successive (comprehension questions to be answered) and simultaneous (reading time).

In spite of these cautions, we believe that we may conclude that for a thorough comprehension in reading a foreign language, a thorough conceptual analysis is needed (results 1 and 2), but a thorough syntactic analysis is not needed (results 3, 4, and 6). We think that this general finding is true for other reading objectives (e.g., skimming, scanning, search reading; cf., the five reading styles of Pugh, 1978), where the conceptual analysis may be more specific. In our view the other limitations: language researched, register, level of FL knowledge, and frequency of syntactic structures do not affect the claim of universality. It is still possible, however, that a very complex syntax in any particular language needs more careful syntactic analysis, especially in the beginning stages of learning to read that foreign language. The restricted set of syntactic function words and structures and their relatively high frequency could be an alternative explanation for less reading difficulty, but it does not contradict the superfluity of a thorough syntactic analysis, it makes it at least easier.

A conclusion that FL readers give priority to conceptual analysis before a syntactic analysis should be cautioned against, since only simultaneous measurements such as shadowing, psychophysiological and reaction-time methods would allow testing of temporal stage in conceptual and syntactic processing. Although simultaneous, the duration methods in the present studies do not allow such conclusions. The review by Levelt (1978) of a series of language perception experiments (listening in L1) completed in the 60s and 70s, has relevance to reading. The simultaneous-measurement techniques have made it possible to demonstrate the highly interactive nature of sentence-understanding processes: semantic decisions which can take place quite early in the sentence can affect syntactic and phonetic decisions, and it is not quite clear any more what occurs prior to what. Levelt believes that syntax plays an important role in sentence understanding, although it will take much and thorough experimentation to determine how syntactic operations interact with semantic and conceptual decisions as the listener infers the intentions of the speaker. More experimentation is also needed to decide about the temporal staging of conceptual and syntactic processing (as far as it occurs) in FL reading.

7. Conclusion

A safe conclusion could be that FL readers should develop mainly a conceptual strategy in reading a FL, since a syntactic strategy will include a thorough syntactic analysis which is superfluous for normal comprehension-oriented reading. Coming back to the function of the sentence parser as outlined in 1.1, the foregoing data suggest that the sentence parser is

primarily concept-oriented and that L2 reading is mainly conceptually and less syntactically guided.

The findings of the present study also suggest consequences for the hypothesis of Contrastive Analysis (CAH) related to FL reading. As has been noted elsewhere (Ulijn, 1977; 1978), syntactic L1-L2 contrasts do not cause more L2 reading difficulty than syntactic L1-L2 parallels. So CAH in its strong version (L2 difficulties can be predicted by contrasts of L2 with L1) cannot be true with respect to the syntactic level in FL reading. Because of the character of the lexical analyses from the SHADOK project, more research is needed. Careful replication is required (Ulijn et al., in preparation). If conceptual analysis is important in L2 reading, and content words are the main carriers of meaning in the text, it will be of utmost importance to plan experiments on the L2 lexicon in general, which account for the results of word recognition experiments in L1.

7.1 Implications for teaching FL reading

Implications of the foregoing results for teaching FL reading have been discussed in detail elsewhere (Ulijn, 1978a; b; 1979; 1980; in press). Therefore, a very short summary seems appropriate here.

In teaching a foreign language it seems to be important to impart all kinds of content words, such as technical terms in a specialized register. It is also worthwhile considering how they contrast with the first language, especially in the case of misleading cognates.

Syntactic function words and structures are easy to teach because of their restrictive set in any language. But, without neglecting them, they

are entitled to only a modest amount of attention, even if they contrast with the first language. On the basis of confirmed difficulty in experiments 5 and 6, the following syntactic structures merit special attention in teaching to read French: construction absolue, de façon à, and à moins de.

Footnotes

[1]The term model corresponds in this article more to approach, conception, or framework. A scientific model would be an abstraction of the reality, allowing all kinds of statistical predictions, which rarely occur here.

[2]We prefer the term polysemy, because it can refer to more than two meanings of the same word, and we would reserve the term ambiguity for sentence or syntactic ambiguity which means that the sentence or syntactic structure can have two meanings.

[3]The correct answers were (see Appendix 1): 1. non (not included, 2. à gauche, 3. oui, 4. avant, 5. après, 6. après, 7. oui, 8. derrière ou à gauche.

Acknowledgements

This paper was written when the author was visiting at Stanford University (USA) through a grant from the Netherlands Organization for the Advancement of Pure Research (1979-1980).

An earlier draft was presented at the Third ~~General~~ Second Language Acquisition Research Forum at Los Angeles, February 1980.

The author is indebted to Dr. G.Kempen and Mr. P.Huijbers for their assistance in some of the experiments done at Nijmegen University, The Netherlands (1979-1980). He wishes to acknowledge the valuable comments on a previous draft of this paper from Dr. Hellen Guttinger, University of Florida at Gainesville, visiting at Stanford University in 1979-1980. Special thanks to Jay Thorp who typed the manuscript.

References

Aronson-Berman,R. (1978): How hard is it to read? Syntactic Complexity as a cause of reading difficulty,paper read at the AILA Congress, Montreal.

Clark,H.H. & E.V.Clark (1977): Psychology and language, New York:Harcourt.

Cowan,J.R. (1976): Reading,perceptual strategies and contrastive analysis, Language Learning, 26 (1),95-109.

Cziko,G.A. (1978): Differences in first- and second-language reading: the use of syntactic, semantic and discourse constraints, Canadian Modern Language Review,34 (3), 473-89.

Dubois,J et al.(1975):LEXIS, dictionnaire de la langue française,Paris:Larousse.

Gougenheim,G. et al.(1964):L'élaboration du français fondamental,Paris: Didier. (later version by the French Ministère de l'Education Nationale)

Gray,W.S. (1968): The major aspects of reading,in: H.M.Robinson (ed.),Sequential Development of reading abilities,University of Chicago Press.

Herriot,P. (1971): An introduction to the psychology of language,London: Methuen.

Kempen,G.A.M. (1976): De taalgebruiker in de mens,Groningen:Tjeenk Willink

Klare,G.R. (1963): The measurement of readability , Iowa State University Press.

Kontinnen,R. (1978),An English language teaching experiment in the comprehension of scientific texts, in:K.Sajavaara et al. (ed.).Further Contrastive Papers,University of Jyväskylä,Finland.

Levelt,W.J.M.(1978): A survey of studies in sentence perception: 1970-1976, in: Levelt,W.J.M. & Flores d'Arcais, G.B.,(eds.),Studies in the perception of language,New York:Wiley.

Mackworth,J.F. (1972): Some models of the reading process: Learners and skilled readers,Reading Research Quarterly,701-733.

Mason,J.M. et al. (1979): Effects of polysemous words on sentence comprehension, Reading Research Quarterly,49-65.

Noordman,L.(1979): Inferring from language,New York: Springer Verlag.

Pugh,A.K. & E.A.Lunzer (1979): Language in use,Analysis of text and the reader, course in educational studies,the Open University,England.

Pynte,J. (1978): The intra-clausal syntactic processing of ambigous sentences, in:Levelt,W.J.M. & Flores d'Arcais, G.B. (eds.), Studie in the perception of language,New York: Wiley.

Robinson,H.M. (1966): The major aspects of reading,in: H.A.Robinson (ed.), Reading: seventy-five years of progress, University of Chicago Press.

Rumelhart,D.E. (1977): Towards an interactive model of reading,in: S.Dornic (ed.),Attention and performance VI,Hilsdale, (N.J.): Lawrence Erlbaum Associates, 573-603.

Schank,R.C.(1975): Conceptual information processing,Amsterdam:North-Holland.

Ulijn,J.M. (1975):Analyse d'erreurs et compréhension écrite d'une langue seconde à buts vocationnels,ITL,International Journal of Applied Linguistics,Louvain 17-33

Ulijn,J.M. (1977): An integrated model for first and second language comprehension ans some experimental evidence about the Contrastive Analysis Hypothesis, System,International Journal of Educational Technology and Language Learning? 5 (3),187-199.

Ulijn,J.M. (1978): French as a foreign language in engineering education-an investigation into the reading comprehension,Ph.D.Thesis Nijmegen University in Dutch with summaries in English,French and German,London :University Microfilms International or Arlington: ERIC (ED 157 011).

Ulijn,J.M. (1979a): L'apprentissage de la lecture du français scientifique et la langue maternelle,Working Papers on Bilingualism,19,89-114,Toronto: OISE (Arlington:ERIC ED ~~xxxxxx~~ 152 066).
Ulijn,J.M. (1979b): Le registre scientifique et technique et ses constantes et variantes supra-linguistiques,Fachsprache,International Journal of Language for Special Purposes (LSP),Vienna: Braumüller.
Ulijn,J.M. (1980): Foreign language reading research: recent trends and future prospects,Journal of Research in Reading, Leeds, 3 (1),17-37.
Ulijn,J.M. (in press): Conceptualigation in second language comprehension- experimental findings on this process in relation to reading the first language, in: Cortese G. (ed.), Reading in foreign languages, theoretical and practical issues, Turin: Franco Angeli (Arlington:ERIC ED 171 110).
Ulijn,J.M. & G.A.M. Kempen (1976): The role of the first language in second language reading comprehension- some experimental evidence, in: G.Nickel (ed.),Proceedings of the 4th international congress of applied linguistics, Stuttgart: Hochschul Verlag, 495-507.
Underwood,G. & P. O'B. Holt (1979): Cognitive skills in the reading process: a review, Journal of Research in Reading, Leeds 2 (2), 82-~~92~~ 94.
Vesemael,T. van (1979): Effects of French tense marking suffixes on the reading behavior of Dutch students: a pilot study,paper read at the Anglo-Scandinavian Conference: Language and Reading, Leeds. April.
Winograd,T. (forthcoming): Language as a cognitive process.
Yorio, C. (1971): Some sources of reading problems, Language Learning,21 (1),106-115

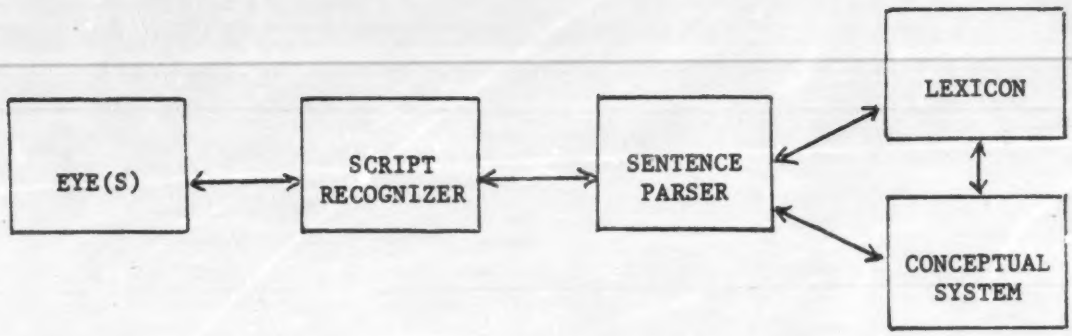


Figure 1. The reader in man

Table 1

Distribution of the Content Words of the SHADOK Text over Polysemous Words, One-Concept Words, and over Easy/Difficult

	Polysemous Words	One-Concept Words	Total
Easy	30	37	67
Difficult	60	39	99
Total	90	76	166

Chi-square test results were 4.03 which was significant ($p < .05$). Polysemous words cause more reading difficulty than one-concept words.

Table 2

Distribution of 20 Technical Terms of the SHADOK Text over Cognates, Misleading Cognates, and over Easy/Difficult

	Cognates	Misleading Cognates	Total
Easy	8	1	9
Difficult	7	4	11
Total	15	5	20

Table 3

Distribution of the Words of the SHADOK Text over Content Words, Syntactic Function Words, and over Easy/Difficult

	Content Words	Function Words	Total
Easy	67	59	126
Difficult	99	32	131
Total	166	91	257

Chi-square analysis yielded 14.09, which was highly significant ($p < .001$). Content words caused more reading difficulty than syntactic function words.

Table 4

Total Number of Incorrect Answers Distributed over the Nationality and Context Conditions

	Context				
	With City Map	Without City Map	Total	Max (100%)	% Incorrect
Dutch (n=24)(F2)	21	26	47	168	28.0
French (n=24)(F1)	7	23	30	168	17.9
Total	28	49	77	336	22.9
Max (100%)	168	168	336		
% Incorrect	16.6	29.2	22.9		

Table 5

Mean Reading Times in Seconds for French and Dutch Subjects and for the Conditions with and without City Map

	With City Map	Without City Map
Dutch (n=24)(F2)	142.30	162.09
French (n=24)(F1)	56.08	82.49

Table 6

Mean Reading Times in Seconds for French and Dutch Subjects and for the Conditions Parallel and Contrastive of the 18 Sentences

	Parallel Version (P)	Contrastive Version (C)
Dutch (n= 24)(F2)	154.46	149.96
French (n=24)(F1)	70.47	67.62

Table 7. Mean reading times of parallel (P) and contrastive (C) versions of 18 French sentences, number of words per sentence (n/w) and number of sec. per word (s/w) distributed over 12 syntactic structures for 24 French (F1) and for 24 Dutch (F2) subjects.*

Syntactic structure	Sentence Number	Linguistic description: Parallel	Contrastive	F1 P	n/w	s/w	C	n/w	s/w
1.Temporelle	2.2	avant que	avant de	52.008	12	4.333	77.167	10	7.717
	4.2	quand	gérondif	63.167	11	5.742	62.250	10	6.225
	6.3	lorsque	construction absolue	44.083	9	4.898	45.250	8	5.656
2.Relative	5.2	pronom relatif	participe	91.667	17	5.392	93.250	16	5.828
3.Causale	7.2	comme	participe	50.333	12	4.194	46.083	11	4.189
	8.5	parce que	constr. absolue	69.917	27	6.293	105.000	25	4.200
4.Condition	5.7	si	constr. absolue	91.833	23	3.993	96.500	22	4.386
	6.4	à condition que	à condition à	83.333	16	5.208	84.083	16	4.005
5.Consécutive	3.3	de façon que	de façon à	61.750	16	3.859	85.250	15	5.683
6.Opposition	8.3	à moins que	à moins de	70.833	14	5.060	66.500	13	5.115
7.Voix passive /moyenne	3.1	être	se	51.000	11	4.636	52.333	11	4.758
8.Nécessité	2.1	vous devez	il vous faut	68.083	13	5.237	55.750	14	3.982
	2.4	,,	,,	57.667	11	5.242	47.333	12	3.944
9.Subjonctif	4.3	infinitif	subjonctif	73.500	19	3.868	72.083	20	3.604
10.Ne-explétif	5.6	-	ne	54.083	10	5.408	42.667	11	3.879
11.Succession d'ordre	4.1	Adjectif + Substantif	Substantif + Adjectif	88.333	23	3.841	107.667	23	4.681
	6.2	Sujet + Verbe	←Verbe + Sujet	51.750	11	4.705	47.333	11	4.303
12.Mise en relief	5.3	-	C'est ... que	45.000	8	5.625	50.833	11	4.621

* This indication has to be very short. We prefer the original French terminology. For the sentences themselves, see Appendix 1. The underscored ~~(in italics or bold)~~ figures stand for peaks of relative F2 difficulty (>14.0 s/w)

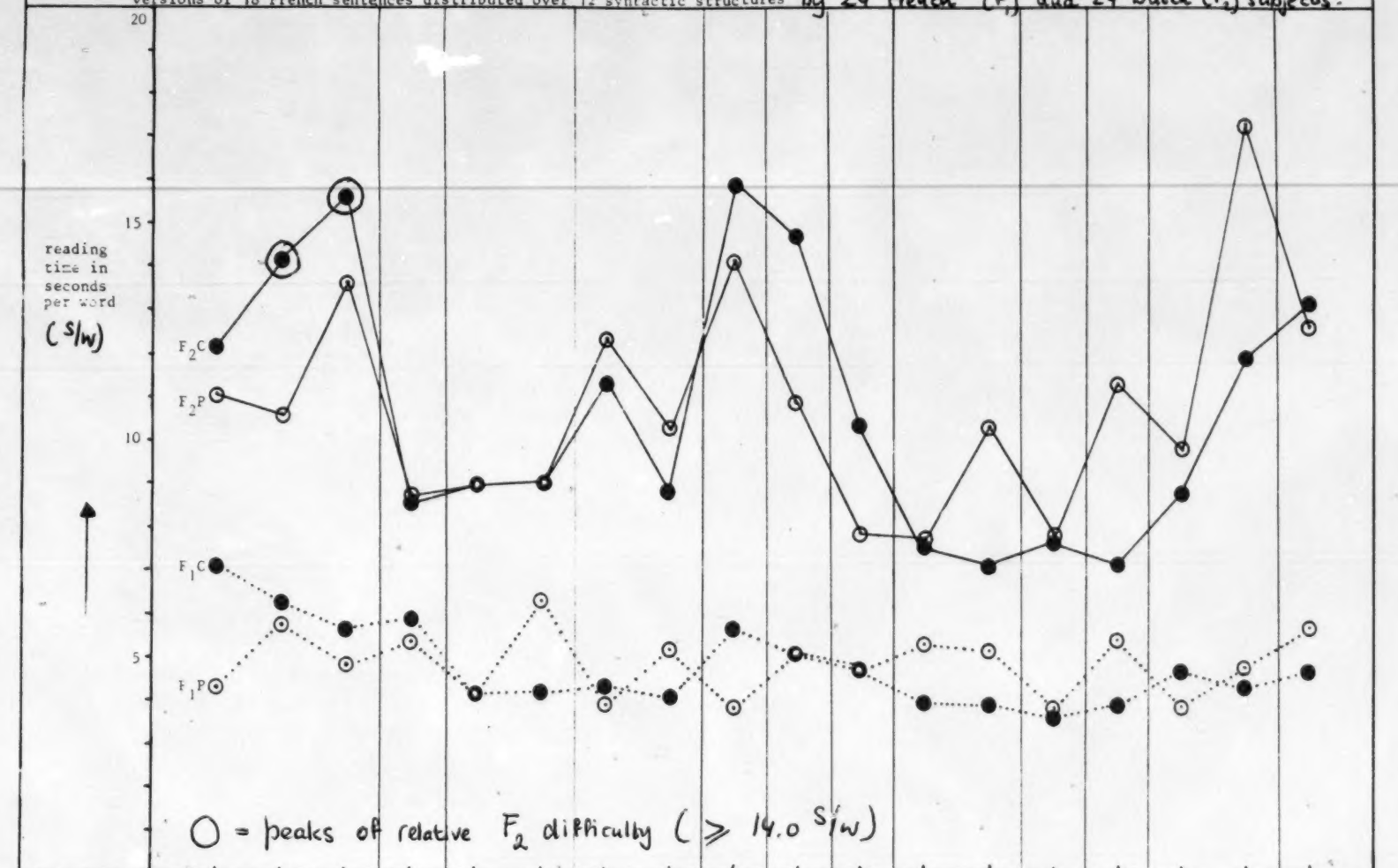
printer in italics or in bold type please !

(table 7. other part)

F2					
P	n/w	s/w	C	n/w	s/w
134.083	12	11.174	122.167	10	12.217
117.833	11	10.712	141.417	10	14.142
117.667	9	13.074	124.750	8	15.594
149.167	17	8.775	137.833	16	8.615
108.000	12	9.000	98.917	11	8.992
245.083	27	9.077	228.250	25	9.130
285.583	23	12.147	251.750	22	11.443
164.750	16	10.297	142.333	16	8.896
224.667	16	14.041	239.750	15	15.983
152.833	14	10.917	191.500	13	14.731
87.500	11	7.955	114.667	11	10.424
102.333	13	7.872	105.667	14	7.548
113.833	11	10.348	86.000	12	7.167
148.917	19	7.838	154.250	20	7.713
113.250	10	11.325	79.167	11	7.197
226.583	23	9.851	204.417	23	8.888
190.167	11	17.288	131.917	11	11.992
101.000	8	12.625	144.333	11	13.121

(S/W)

Fig. 2: Mean reading times in seconds per word for French as a first (F_1) and as a second language (F_2) for parallel (P) and contrastive (C) versions of 18 French sentences distributed over 12 syntactic structures by 24 French (F_1) and 24 Dutch (F_2) subjects.



SENTENCE NR.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SYNTACTIC ~~FUNCTION~~ STRUCTURE	1. Temporelle			2. Relative		3. Causale		4. Condition	5. Consécutive	6. Opposition	7. Voix ~~moyenne~~ passive moyenne	8. Nécessité		9. Subjonctif	10. Ne explétif	11. Succession d'ordre		12. Mise en relief

Appendix 1.

The sentences used in the replication experiment of SHADOK (part. 5)

TROUVER LE BON CHEMIN (C = Contrastive version with Dutch; P = Parallel version with Dutch)

1. Pour le centre de la ville de Beausite (pilot item, results not included in the experiment)

1.1. *Vous quitterez* (C) / *Quittez* (P) l'autoroute à la sortie de "Beausite".

1.2. *Une fois arrivé* (C) / *Une fois que vous serez arrivé* (P) au panneau "sens unique", vous continuez tout droit.

1.3. *Vous suivrez* (C) / *Suivez* (P) en fait la flèche "centre-ville", pour atteindre la place du marché.

1.4. *En reprenant l'autoroute A6* (C) / *Si vous vouliez reprendre l'autoroute A6* (P), vous pourriez suivre le même itinéraire.

Question: Avez-vous le droit de suivre le même trajet, en revenant ou non?

2. Pour le parking souterrain

2.1. *Il vous faut* (C) / *Vous devez* (P) garer votre voiture pour la durée de votre visite à Beausite.

2.2. Vous allez le faire *avant de garer* (C) / *avant que vous gagniez* (P) la place du marché.

2.3. Il y ~~a~~ un parking souterrain à l'entrée de la ville.

2.4. Pour y arriver *il vous faut* (C) / *vous devez* (P) prendre la première rue à gauche.

Question: Où trouvez-vous le parking souterrain, à gauche ou à droite?

3. Pour la cathédrale

3.1. Le même trajet *s'effectue* (C) / *est effectué* (P) jusqu'à la place du marché.

3.2. Là vous verrez la tour de la cathédrale à votre droite.

3.3. Serrez de ce côté *de façon à pouvoir emprunter* (C) / *de façon que vous puissiez emprunter* (P) la rue qui y mène directement.

Question: Faut-il passer par la place du marché, ou non?

4. Pour la gare

4.1. A partir de la place du marché vous suivez *une avenue très longue* (Cc) / *une très longue avenue* (CP) au bout de laquelle vous voyez un passage à niveau.

4.2. *En arrivant* (Cc) / *Quand vous arrivez* (CP) devant la voie ferrée, vous tournez à gauche.

4.3. Adressez-vous au bureau de renseignements de la gare et dites-leur *qu'on vous remette* (Cc) / *de vous remettre* (CP) un ticket de stationnement.

Question: Faut-il tourner à gauche avant ou après la voie ferrée?

5. Pour le stade

5.1. Vous êtes à la place du marché.

5.2. Prenez l'avenue *partant* (Cc) / *qui part* (CP) dans la direction EST et vous tombez sur un agent de police.

5.3. *C'est à cet endroit que* (Cc) / *A cet endroit* (CP) vous devez aller tout droit.

5.4. Vous arrivez dans un quartier à l'exterieur du boulevard periphérique.

5.5. A un moment donné vous voyez le stade sur votre gauche.

5.6. Je crains que le parking avant le stade *ne soit* (Cc) / *soit* (CP) complet.

5.7. *Ce lieu de stationnement étant impossible* (Cc) / *Si ce lieu de stationnement est possible* (CP), il vous serait conseillé de prendre celui qui le suit du même côté de l'avenue.

5.8. Question: Le stade se situe-t-il avant ou après l'agent de police?

6. Pour le théâtre

6.1. Partez dans la direction NORD;

6.2. Vous passez par des feux où *circulent beaucoup de poids lourds* (Cc) / *beaucoup de poids lourds circulent* (CP).

6.3. *Ce carrefour étant traversé,* (Cc) / *Lorsque ce carrefour sera traversé* (CP), vous poursuivez votre chemin.

6.4. *A condition d'avoir le pont ouvert* (C) / *A condition que le pont soit ouvert* (P) vous allez vous retrouver automatiquement en face du théâtre.

Question: Le théâtre se situe-t-il avant où après les feux?

7. Paris par l'autoroute A6 (I)

7.1. La place du marché est toujours votre point de départ pour prendre la direction Paris.

7.2. *La route étant barrée* (C) / *Comme la route est barrée* (P) vous allez suivre l'itinéraire fléché "déviation".

7.3. A un moment donné, après les travaux, vous finissez par tourner à droite, en rejoignant ainsi le chemin qui conduit à l'autoroute direction Paris.

Question: Y a-t-il une route barrée ou non?

8. Pour Paris par l'Autoroute A6 (II)

8.1. Vous continuez dans la direction Paris-Autoroute.

8.2. Le boulevard périphérique coupe votre chemin qui s'appelle désormais RN 111, et qui va longer une rivière à la sortie de la ville.

8.3. Cette rivière sera à votre droite, *à moins d'avoir* (C) / *à moins qu'elle ait* (P) envahi les quais.

8.4. Dans ce cas une déviation sera mise en place.

8.5. Vous quittez la RN 111 et passez tout droit par le pont, *la bretelle d'accès étant située de l'autre côté de la rivière* (C) / *parce que la bretelle d'accès est située de l'autre côté de la rivière.* (P)

8.6. De cette façon vous pouvez vous engager sur l'autoroute direction Paris.

Question: Où se trouve la rivière maintenant?